Delta Dredged Sediment Long-Term Management Strategy Database User Guide

Version 2.0

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1 Introduction

1.1 History of the Delta Long-Term Management Strategy

This User Guide provides technical documentation for a database generated in support of the Delta Dredged Sediment Long-Term Management Strategy (LTMS) project. The database was based on, and is compatible with, databases generated for other California sediment-related database projects, including:

- Contaminated Sediment Task Force (CSTF) (http://www.coastal.ca.gov/sediment/sdindex.html);
- Sediment Quality Objectives (SQO) (http://www.swrcb.ca.gov/bptcp/sediment.html);
- San Francisco Bay region's Dredged Material Management Office (DMMO) (http://www.spn.usace.army.mil/conops/dmmo.htm).

The Delta estuary results from the confluence of California's two largest rivers: the San Joaquin and Sacramento rivers (Figure 1-1). The region is important for the two largest water distribution systems: the Central Valley Project, operated by the U.S. Bureau of Reclamation, and the State Water Project, operated by the California Department of Water Resources (DWR). The Sacramento and San Joaquin River deep-water channels also provide important shipping access to the Ports of Sacramento and Stockton. There is an ongoing need to dredge the channels for navigation, water conveyance, flood control, and levee maintenance. There are regulatory concerns about the potential impacts to water quality and the ecosystem from dredging activities. In 2004, local sponsors of Delta dredging projects and the U.S. Army Corps of Engineers (USACE) met to explore the feasibility of developing a long-term management strategy (LTMS) for dredging and dredged materials placement or reuse in the Delta. The first step was to develop a database in support of this effort. Further information about the LTMS project can be found at http://www.deltaltms.com/index.htm.

1.1.1 Delta LTMS Sediment Database

The goal of the database is to characterize sediments in areas planned for dredging to assess quality and aid in selecting appropriate management approaches. Example management approaches include selection of potential material suitable for wetland creation, rehabilitation, and restoration; levee maintenance; and other dredged material beneficial re-use schemes. In 2002, a database ("DREDGE") was compiled through the efforts of the Delta Dredging and Reuse (DDRS) project, compiled by California Department of Fish and Game (CALFED 2002). The DREDGE Database was reviewed for quality, normalized to fit into the new structure, and included in the LTMS Database. Other sources of available data included data from the USACE, Sacramento District containing dredging project data collected since 2001; relevant data from the SQO project conducted by the State Water Resources Control Board, and related efforts conducted by the Central Valley Regional Water Quality Control Board (CVRWQCB).

The format of the database was selected so as to be compatible with other related databases, and also in a format easily accessible by LTMS members and stakeholders. All sampled stations were required to have coordinates so that the data could be used in a GIS. Recommendations for incorporation of the data into an internet-based system are included in the User Guide (Section 1.3).

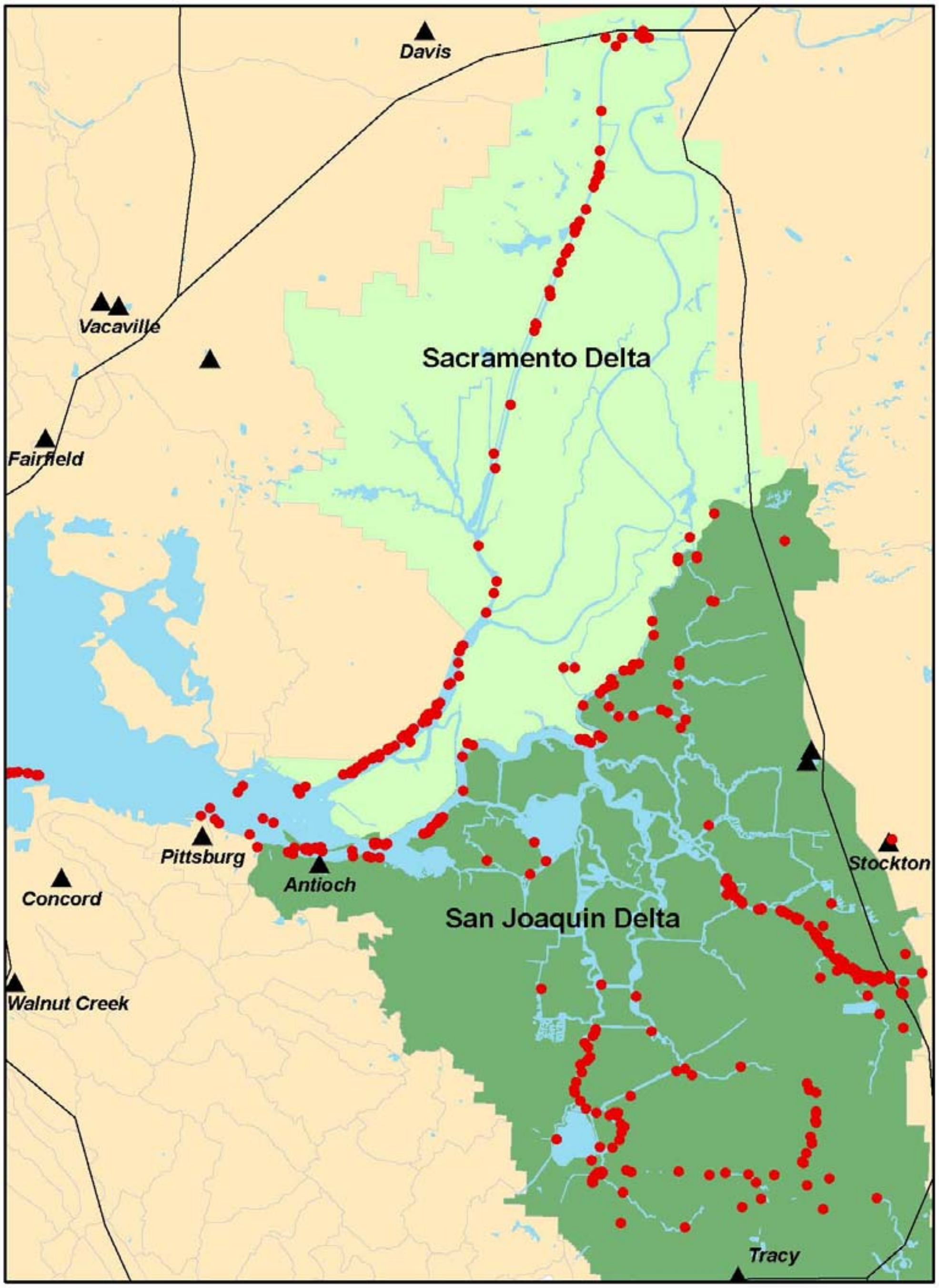


Figure 1-1. Map of station locations of the Delta LTMS Database within and near the Sacramento and San Joaquin Watersheds

1.1.2 STUDIES SELECTED FOR THE LTMS DATABASE

An inventory of available electronic and non-electronic data was prepared, and included the type of available data (sediment, elutriate, or tissue chemistry, bioassay, as well as other incidentally collected water quality). A list of contact names was developed and queried for potentially additional datasets.

The sources of electronic data readily available for this database included:

- Dredged material characterization reports for the Stockton and Sacramento Deep Water Shipping Channels from the USACE Sacramento District (since 2001);
- Applicable data from the Statewide SQO Database;
- Delta Dredging and Reuse (DDRS) DREDGE database;
- Central Valley Regional Water Quality Control Board studies (Middle/Old Rivers);
- Port of Stockton and Port of Sacramento;
- Data extracted from the SWAMP Database for the Central Valley region (http://www.swrcb.ca.gov/swamp/).

Outside of the USACE DWSC studies, the data available for the Ports of Stockton and Sacramento were for soil and groundwater studies so were deemed of lower priority.

1.2 Data Compilation and Quality Assurance Procedures

Data from studies identified as the highest priority from the study inventory were compiled into the database. The studies were reviewed for quality and completion prior to incorporation into the database. The quality assurance process is described below.

1.2.1 STUDY TYPES

The database contains samples from both dredging and monitoring studies. Samples for monitoring studies were often collected using single grab samples, whereas dredging samples were often collected with cores composted over a wider area. Therefore, the database reflects this primary difference, thus studies are classified as one of the following:

- Dredged material characterization studies (D);
- Monitoring and/or research studies (M).

Samples from the dredging studies are dominated by sediment chemistry and associated tests (Table 1-1). Bulk sediment samples (referred to as total recoverable metals specifically for metal analyses) are generally measured in delta-related dredging projects to evaluate potential re-use of the dredged material. The waste extraction tests are indicative of the concentrations in the leachate from confined dredged material. Elutriate tests measure the amount of contaminant that is easily stripped from the sediment. In particular, the elutriate effluent test (EET) predicts the dredge pond effluent water concentrations after 24 hours of settling. The dredge elutriate test (DRET) predicts the in-water effects of dredging.

Table 1-1. Number of samples in LTMS Database for each chemical analysis type

Water Body	Locality	Bulk Sediment	WET[1]		DI-WET[2]		Citr-WET[3]	DRET[4]		EET[5]		SET[6]		MET[7]	
			Diss	Total	Diss	Total	Total	Diss	Total	Diss	Total	Diss	Total	Diss	Total
Andrus Island	Andrus Island	9													10
	Korth's Pirates Lair	4		1		1									1
	Oxbow Marina	2		2											
Middle River	Middle River	23	6	9	6	6						7	7		6
Old River	Old River	13	2	2	9	2						9	9		
Sacramento River	Sacramento Deep Water Ship Channel	73		2	6	65	1	6	6	11	11			14	59
	Sacramento River	5													
Sacramento San Joaquin Confluence	Antioch Municipal Marina	1				1									
	Antioch New Bridge Marina	6				6									
	Kie-Con Barge Landing	1				1									
	Lauritzen Marina	13		2		5									
	PG&E Power Plant	1													
	Sacramento San Joaquin Confluence	52													
San Joaquin River	Bethel Island	5		3		2									
	Buckley Cove / Stockton Sailing Club	3		3		3									
	Dells Harbor	7	7		7	1						7			
	Grantline Canal	17		16		16									
	Lost Isle Marina / Acker Island	1													
	McMullin Tract	4				4									
	Morman Channel	3													
	North Delta Project	22		21											
	Orwood Marina	1		1											
	San Joaquin River	10													
	South Delta Project	87		70		63									
	Staten Island	35		35		35									
	Stockton Deep Water Ship Channel	136		6	7	104	8	15	15	37	41			30	43
	Tyler Island	8				8									
	Village West Marina	3				3									
San Joaquin River Tributaries	Bear Creek	1													
	Calaveras River	1													
	French Camp Slough	3													
	Ingram Creek	1													
	Lone Tree Creek	3													
	Merced River	1													
	Mokelumne River	2													
	Mt House Creek	1													
Suisun Bay	Suisun Bay / New York Slough	16		7		5									
Total		**574**	**15**	**180**	**35**	**331**	**9**	**21**	**21**	**48**	**52**	**23**	**16**	**44**	**119**

[1]Waste Extraction Test
[2]De-Ionized Water WET
[3]Citrate buffer WET
[4]Dredge Elutriate Test
[5]Elutriate Effluent Test
[6]Standard Elutriate Test
[7]Modified Elutriate Test

1.2.2 DATA COMPILATION AND QUALITY ASSURANCE PROCEDURES

Monitoring and research studies were submitted in multiple electronic formats and converted into the database. All of the Sacramento and Stockton Deep Water Shipping Channel (DWSC) reports were scanned as PDF files by the USACE Sacramento District, and then converted into Excel using ReadIris™ Pro, an optical character reader- (OCR-) based program. Specific quality assurance/quality control (QA/QC) procedures were conducted based on the method of input of the studies.

DREDGE Database Quality Assurance Procedures

Separate quality assurance procedures were conducted on the studies incorporated into the DREDGE Database, in addition to the quality review conducted during database compilation (CALFED 2002). For every table in DREDGE, the following checks were employed:

- The uniqueness of the records were evaluated, and reason for duplicates were assessed;
- The relationships between that table and others were assessed to ensure that there were no orphan records (for example, chemistry records with no record in the sample table);
- Each field within each table was evaluated for gaps (nulls); if possible these gaps were filled;
- Each table was evaluated for consistency among the fields within each study; details are provided below;
- Unreasonable data were identified within possible limits, including sample depths, dates, locations, and results outside of statistical ranges; an effort was made to find the original data to check these data.

General details on the modifications to the DREDGE Database are reported below. Specific details on the exact changes made to the DREDGE Database are available in the Database Quality Assurance Plan submitted as part of the Work Plan of the project.

The Study Names were standardized based on location, year of project, and ancillary information from document title/study notes (river miles, etc.). A standardized Agency was developed per the requirements of the database structure that defines the agency responsible for that study. This was developed from the Source and Contact fields in the original database; if no agency could be identified, then "Unknown" was used for that agency. The database was checked to make sure that the data types listed in the study table was present in the database. One study was noted as having bioaccumulation (tissue chemistry) data, but no such data could be identified. One study had no name and no data so was deleted from the Study table.

All of the stations were plotted up in GIS along with the San Joaquin and Sacramento watersheds to make sure they fell within the boundaries of water layers. Some stations appeared to be in NAD27 based on a standardized offset; these were re-projected to NAD83 (comments were added to the database to note these stations).

Many samples had missing dates, so at a minimum a year was assigned. Some studies had obvious inaccurate dates; most of these could be fixed as they were obvious typographic errors within the context of the study. There were many duplicate samples that were evaluated on a per study basis. Most of these were resolved, including field replicates, laboratory duplicates, sample handling (e.g., filtered, different laboratory tests), or samples collected at different station depths or dates. Sample depths were supposed to be reported in cm, but there appear to be a mix of cm and feet, with no documentation, and many null values. These records were edited using the available information and logical assumptions.

For the chemical results, there were many gaps and inconsistent term usage in the preparation and analysis methods used (specifically filtered vs. unfiltered, and the type of elutriate/effluent testing). A subset of records had no matrix or test type. Some results were reported as below detection, when the result was actually the half of detection limit; these results were converted into the reported detection limit. For duplicate records where the value was exactly the same, one of the records was deleted; if two different values were reported and there appeared to be no other differences, the second records was stored as a laboratory duplicate.

Sacramento District PDF Reports Quality Assurance Procedures

The Sacramento District of the COE delivered PDFs of the NOI (Notice of Intent) to dredge for the deep water navigational channels for Stockton and Sacramento channels for the years 2000-2006. Note that the 2000 studies were already in DREDGE, allowing for more intense QA of these studies in the DREDGE database.

The tables within the NOIs were converted into Excel files using an OCR program. These tables were verified at a rate of 100% to check for transcription problems. The appendices in the database were used to hand-enter information missing from the summary tables, including MDLs and RLs, supplementary data, as commonly not all of the measured parameters were reported in the text of the report. A random number of the hand-entered results were checked by a second reviewer at a rate of 10%.

Coordinates reported in an incorrect datum (e.g., NAD27) or coordinate system (e.g., California State Plane) were converted into latitude/longitude in NAD83. All core locations were checked using GIS.

Other Datasets Quality Assurance Procedures

Datasets received through the South Delta Improvement Program (SDIP), including three studies for Middle and Old Rivers, were converted using similar procedures as the Sacramento District datasets.

Available electronic databases for monitoring programs included two stations from the San Francisco-based Regional Monitoring Program (RMP), several stations of data stored within the SWAMP (Surface Water Ambient Monitoring Program) database, and applicable stations sampled as part of the Bay Protection and Toxics Control Program (BTPCP). These data were included with minimal additional QA, except for the general checks listed above (duplicates, data gaps, etc.).

1.2.3 GEOGRAPHIC EXTENT OF THE DATA

The Delta LTMS database contains sediment quality information from the Sacramento and San Joaquin Delta, their tributaries, up to the confluence of the rivers (Figure 1-1). Some stations from the DREDGE database extended into Suisun Bay so these were also included.

Each station was classified based on a series of geographic regions, including California Regional Water Quality Control Board (most are Central Valley) and County. The geographic classification scheme is hierarchal, with broader classifications (regional board, water bodies) to the more detailed category of locality. All collected samples had sediment chemistry data, with the waste extraction tests being the next most common chemical analysis (Table 1-1). Bioassay data were present in many studies, including elutriate testing for many of the dredging studies, as well as sediment studies present for many of the monitoring studies (Table 1-2).

Table 1-2. Number of samples in LTMS Database for each bioassay analysis type

Water Body	Species	Sediment	Elutriate	Interstitial Water	SWI[1]
Andrus Island	*Ceriodaphnia dubia*		7		
	Pimephales promelas		7		
	Selenastrum capricornutum		7		
Middle River	*Ceriodaphnia dubia*		6		
	Pimephales promelas		6		
Old River	*Pimephales promelas*		9		
Sacramento River	*Ceriodaphnia dubia*				5
	Hyalella azteca	5			
	Pimephales promelas		24		
Sacramento San Joaquin Confluence	*Ampelisca abdita*	7			
	Arbacia punctulata			6	
	Ceriodaphnia dubia				3
	Crassostrea gigas		2		
	Eohaustorius estuarius	41			
	Hyalella azteca	3			
	Mytilus edulis		19		
	Mytilus galloprovincialis	6	14		6
	Nephtys caecoides	1			
	Strongylocentrotus purpuratus			1	
San Joaquin River	*Ceriodaphnia dubia*				10
	Hyalella azteca	10			
	Oncorhynchus mykiss		18		
	Pimephales promelas		33		
San Joaquin River Tributaries	*Hyalella azteca*	12			
SFB Carquinez Strait	*Ampelisca abdita*	1			
	Mytilus edulis		1		
	Nephtys caecoides	1			
Total		**87**	**153**	**7**	**24**

[1]Sediment-Water Interface Test

1.3 Database Format and Computer Specifications

The database is called DeltaLTMS_Ver02.mdb. The data are provided in Microsoft Access™ 2000. If you do not know which version of Microsoft Access you have, open your program and look for "About Microsoft Access" under the Help menu. The database can be opened in a version of Access more recent than 2000; when you first open the file, you will be notified that the file needs to be updated.

At the time of delivery (June 2008), the LTMS Database was approximately 17 MB, so requires a computer with sufficient hard drive space to store the database locally, as well as sufficient speed to run queries in the database. It can be used with MS Windows™ operating systems from Windows™ 2000 and above. Because of the size and complexity of database queries, we recommend using a computer with a Pentium processor and at least 256K of RAM.

When the database is opened, an opening screen allows the user to open the automated queries generated for the project (Section 3), or to go directly to the database (Figure 1-2). The queries were generated to help jumpstart using the database.

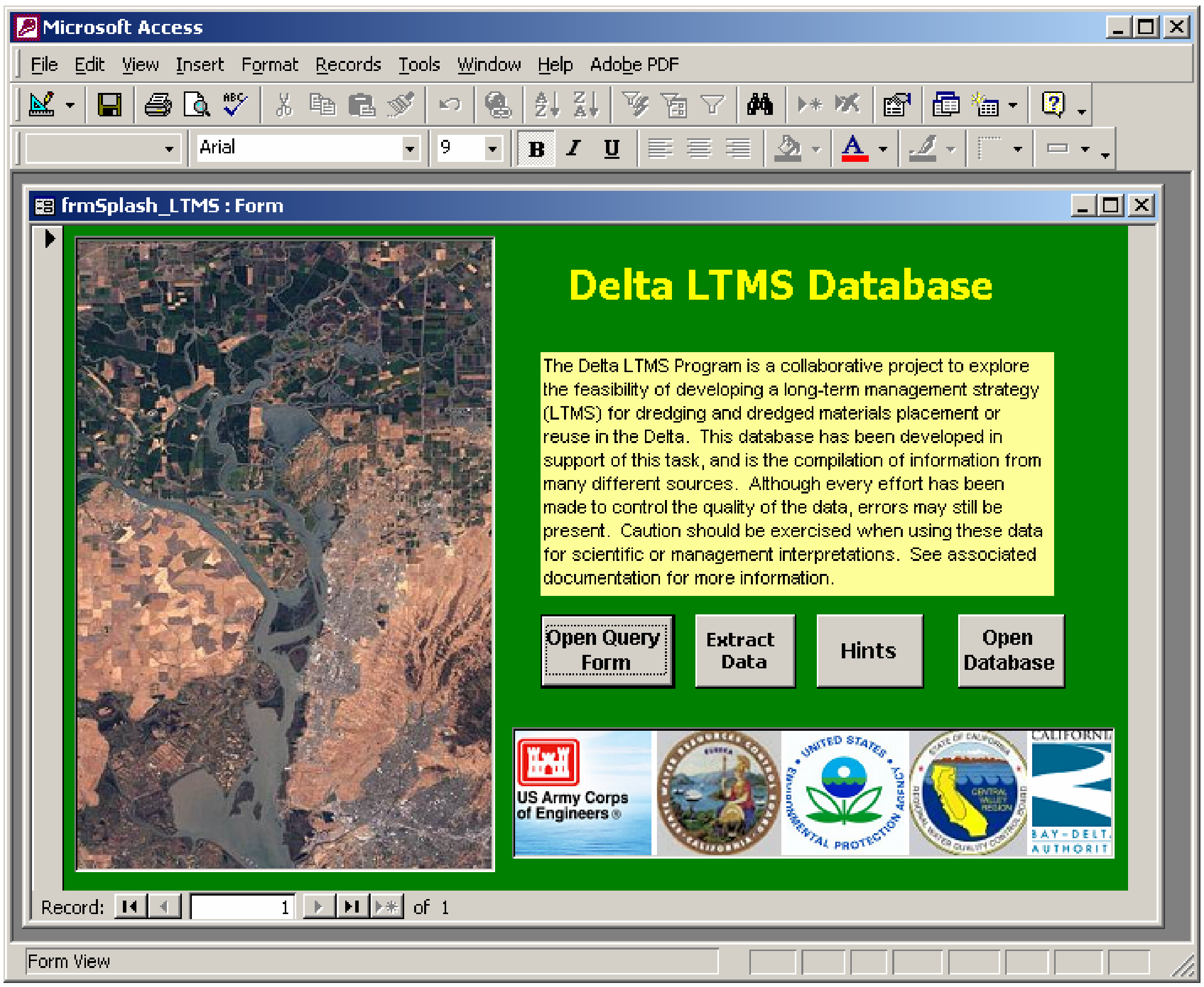


Figure 1-2. Opening screen of the LTMS Database

The database is currently in a personal database (Access) because it was selected as the most common database software owned by most users. For the long-term, it would be most convenient to serve the database over the Internet. The database is compatible with most other database systems, and could easily be converted if necessary. There are several options for this transition:

- The entire database could be downloaded from the project website or agency ftp site. Additional user-specified queries could be developed for the users in order to customize the database for individual users.
- A web-based interface developed for the San Francisco DMMO that includes "wizard-style" queries (helps the user walk through steps for sequential querying) and a map-based search engine that could easily be extended for use in the Delta area. The advantage of this approach is the development of queries specific to dredging issues.
- The database could be compiled in one of the web-based environmental databases supported by the State of California, including the Bay Delta and Tributaries Project (BDAT: http://bdat.ca.gov/), or the Surface Water Ambient Monitoring Program (SWAMP: http://www.waterboards.ca.gov/swamp/).

1.4 Organization and Conventions of the User Guide

This User Guide provides basic information on the structure and key features of the database in Section 2. A guide to the imbedded automated queries, and information on how to modify and create your own queries, are in Section 3. A glossary and references are in Section 4.

Appendix A has a list of studies in the database. Appendix B has links to separate technical documentation, including table and field definitions. This material has been kept in separate files, for the target audience of database managers and computer technical staff. To optimize viewing of the electronic (pdf) version of this document, select 'Windows' and 'Show Bookmarks' to be able to navigate through the sections and figures.

Several conventions are used for different types of information:

♬**NOTE**♬ This notation is used to highlight specific comments or summary statements important to the user.

CONVENTION This notation is used to highlight conventions used when populating the database.

TblStudy Database table names are italicized and underlined.

StationID Field names are italicized and bolded.

"Qry Query Name" Names of pre-designed queries are in quotes, and all start with the preface "Qry."

2 Features and Description of the Database

2.1 Database Structure and Hierarchy

A relational database is an efficient mechanism to store large amounts of data by keeping related information in separate tables that are related by one or more key fields (columns in the table). As an example, information about a whole study is stored in a table called *tblStudy*, so that this information is not repeated for every result. Information is retrieved from the database through the use of a query, which defines a subset of linked tables and contains a series of criteria used to retrieve the specific data of interest.

The LTMS Database contains 39 tables. The list of tables can be seen by selecting the "Tables" category under the list of objects in MS Access database window. Double clicking on a table name in this list will open the table and allow you to view the contents.

2.1.1 Data Tables, Lookup Lists, and Null Field Defaults

There are two types of tables in the database: the data table, and the lookup list. Data tables start with the preface 'tbl' followed by the description of the data within that table (e.g., *tblResults*). These tables contain the actual data stored in the database. The lookup list tables start with the preface 'luList' followed by the list number, and a descriptive name of the information stored in that table. Lookup lists store standardized codes and their definitions used in the data tables. A special lookup table (lkp-DBItems) has been created in support of the Query Form (Section 3) and should not be opened or edited.

There are three ways to discover the definitions and conventions used for the fields within the LTMS Database. First, while a table is open, click on the field, the description will appear in the Status Bar at the bottom of the screen (right above the Task Bar). Second, a description of each field is included in the database dictionary contained in Appendix B of this manual. Finally, this section describes the most important tables and fields used for each type of data stored in the database.

In general, nulls were avoided in the database. Although many of the fields are not required in the database (other than key fields), most were populated with relevant information, or with a standard default value if no information was available. This population effort was conducted so the user could know the difference between the different types of the meaning of null (e.g., no information available vs. not applicable).

Required fields are noted in the table, as well as the default value for valid null fields. Fields that are linked to lookup tables always have default nulls described in the dictionary. The field must match a code in the lookup table, for example, UNK for Unknown, or NA for Not Applicable. Default values are used for these mandatory fields when no other information is available. Nulls were acceptable in comment fields or where null is an implicit not applicable (e.g., null fields in the Qualifier field indicate that there was no qualifier for that result).

CONVENTION – Null values

In order to avoid having blank fields in the database, a series of conventions were adopted to handle missing or unavailable information:

- Missing numeric information has a –99;
- Missing text information has an 'NA; the exception is if there are links to a Lookup List that has a specific code for missing, inapplicable, or unreported data;
- Missing or unreported dates are filled with 1/1/1900;
- Missing or unreported times are filled with 00:00.

2.1.2 Database Structure and Relationships

The LTMS Database structure contains four levels of organization: Study, Station, Sample, and Data. The relationship diagram shown in Figure 2-1 shows all of the fields in each table, as well as the key fields, shown underlined in the top of each table. The structure contains tables that are related on a multiple key index. The data tables are generally related on one or more of the following fields:

StudyID
StationID
SampleID

The tables are related to each other in a specific way, such that for any queries that are developed, the tables must be first be related according to the structure of the database. A more formal relationship diagram (entity relationship diagram), showing the relationships of the data tables to the lookup lists, is linked to this document from Appendix B.

♬NOTE♬ When developing queries, it should not be necessary to set your own relationships, as all relationships have been set up in the database, and enforced (see Glossary for more information).

The top-level hierarchy is the Study. Each study has a unique identifier (***StudyID***). The table *tblStudy* contains information about each one of the studies, including the agency that sponsored the study, and a contact name. A list of studies and associated summary information can be found in Appendix A. The query used to generate Appendix A is also included in the database, and is called "Qry01_WhatStudies;" see Section 3 for a description of that query.

All of the database relationships are enforced, meaning that no data can be added to one (child) table without having matching data in the related (parent) table. When two related tables are opened into a query, the tables will automatically be joined if they are intended to be related. Two legitimately related tables will appear with one or several lines between them, and a symbol that shows the relationship. In the example below, each unique ***StudyID*** in tblStudy is related in a 1-to-many (1-infinity) relationship to a ***StudyID+StationID*** in *tblStation*. In this example, you will not be able to add a new Station to *tblStation* unless the ***StudyID*** is in the station record, and there is already a matching ***StudyID*** record in *tblStudy*.

The next level of the structure contains information about stations, and environmental information collected during a visit to a station (Section 2.1.3). If multiple samples are collected at a station within the same study, that record will have a different ***SampleID***. If only one sample was collected at a station, usually the ***SampleID*** will be "01." The lowest but most important level of the LTMS Database contains the results tables.

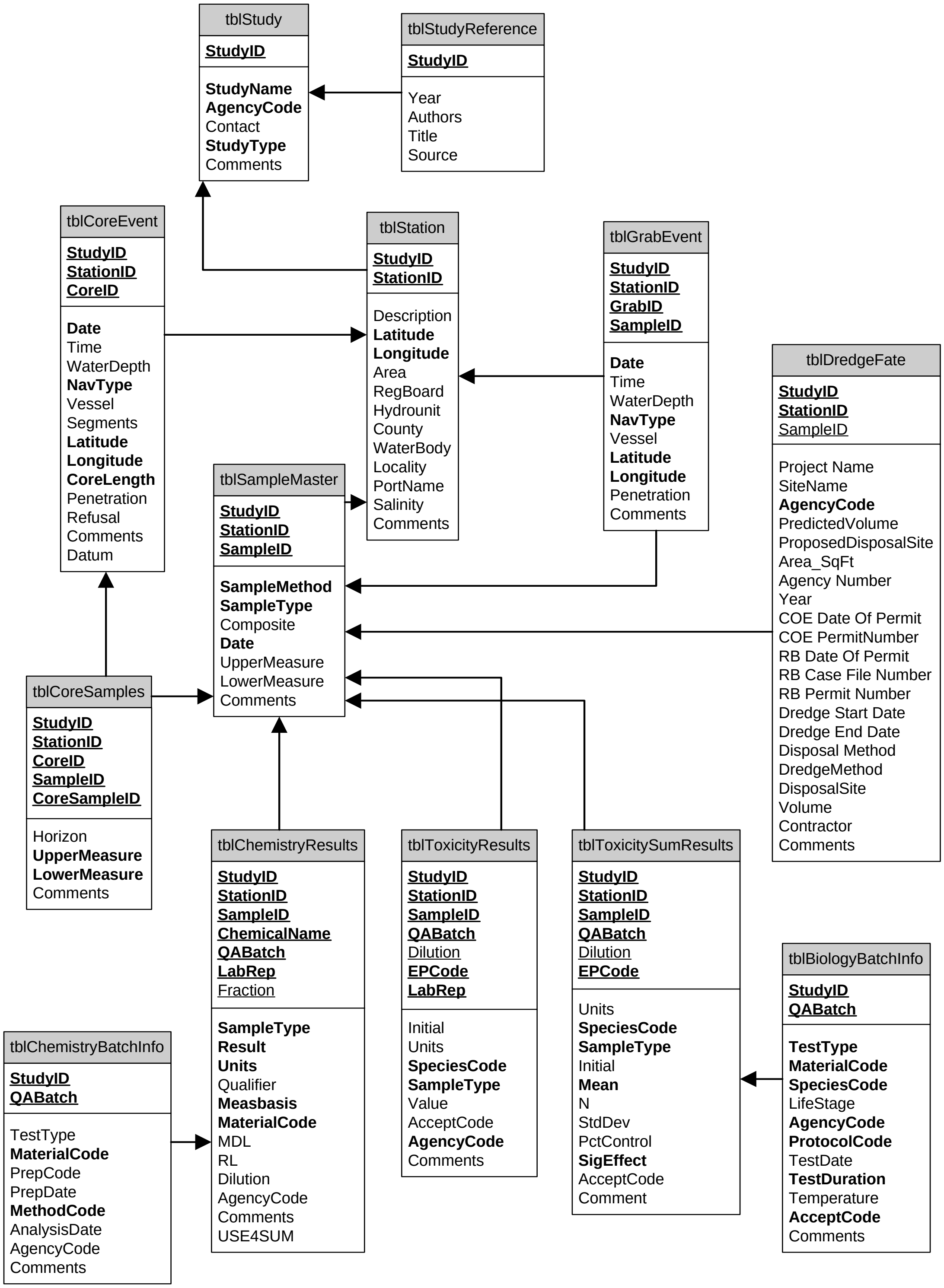
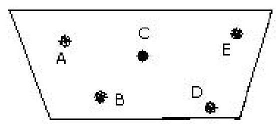


Figure 2-1. Database structure of the data tables of the LTMS Database

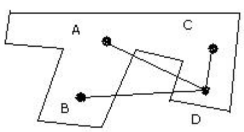
2.1.3 STATIONS, GRABS, CORES, AND LOCATION INFORMATION

All dredging and monitoring data have a geo-referenced location in latitude/longitude coordinates (NAD83). For dredging data, the 'Station' may actually represent an area, such as a dredging polygon from which multiple cores were collected (Figure 2-2). In this case, the field ***Area*** in *tblStation* will be checked to 'Yes.'

In order to assign each dredging area to a point location that could be stored in the station table, a single core location was selected to represent the area. The representative location was selected using an algorithm using GIS software that selected the point that was closest to all the other points (median).



In this case, the core location 'C' would be selected to represent the area.



In this case, the core location 'D' would be selected to represent the area.

Figure 2-2. Example of how a median location was selected to represent a dredging polygon

NOTE If the ***Area*** box is checked to 'Yes' in the Station table, the coordinates provided in that table is a median point selected from several cores collected at that station. Actual coordinates for all the cores collected at that station are stored in the table called *tblCoreEvent*.

Most stations have a geo-referenced location in latitude/longitude coordinates (NAD83). In some cases, station locations were not available; in such cases, the coordinates are reported as –99. In addition to a point location, each station was assigned to one or more regions as noted below (lookup list number in parentheses):

- ***Hydrounit (42)***
- ***Port (46)***
- ***Regional Board (41)*** (California Regional Water Quality Control Board)
- ***Locality (45)***
- ***County (43)***

The watershed name was used for ***Hydrounit*** classification. The Port of Los Angeles provided a GIS layer for watersheds for California. County and Regional Board boundaries were obtained from the California Teale Data Center (see http://www.gis.ca.gov/). The Locality regions were based on the most relevant water body and were reviewed and edited by the USACE, Sacramento District. These are the locations that are used by the Query Wizard to filter data (Section 3).

In addition to location information, each station was assigned a ***StationType*** as itemized in Lookup List 47:

- Control sample (bioassay data negative control)
- Dredging site
- Monitoring site (associated with monitoring studies)
- Placement site
- Reference station

Control stations were identified as to location of the collected sediment (e.g., Tomales Bay); if this information was unavailable or inapplicable (e.g., water controls), the regions were classified as 'NA.' The other station types are used in the Query Wizard for filtering data (Section 3).

CONVENTION – Station Locations

There are some latitude/longitudes that are unknown or were unavailable, these are noted with a –99. Latitude/longitudes that are noted with zero (0) values are not geo-referenced stations (e.g., laboratory control samples).

Due to the differences in sample collection between different study types, the database structure has several tables to capture these variable sample designs. Dredged material characterization data are often collected using long cores, with composite samples created from parts of several different cores. As an example, one sample may reflect the top half of five different cores (five different locations), representing an upper layer of a berth area to be dredged. Conversely, monitoring and research data typically commonly are collected using a grab sampler, with one sample reflecting a single point location. The structure reflects this difference, with several tables containing only core-related data (tables starting with 'tblCore'), and several tables reflecting only grab-related data (tables starting with 'tblGrab'). In general, tables with the preface tblCore contain only dredging-related information.

The information associated with the actual core or grab collected is stored in *tblGrabEvent* for grab samples, and *tblCoreEvent* and *tblCoreSamples* for cores. The Core Event table contains the actual latitude and longitude of each collected core. These tables also contain field-related information including ***Vessel***, navigation type (including GPS or DGPS, as listed in luList28_NavType), and the date and time of sampling. If the upper and lower sediment depth of the individual samples collected from each core was reported, than this information is stored in *tblCoreSamples*.

2.1.4 Samples and Sampling Information

Below the station level, the nomenclature ***SampleID*** is used. The ***SampleID*** is used to match samples analyzed for sediment chemistry and bioassay data, if applicable. The ***SampleID*** will be the same as in the original database, if applicable.

There are several standardized descriptors of each sample, generally linked to a Lookup List that can be used in data analysis, as described below.

Sample Method - The field ***SampleMethod*** links to luList03, and is used to describe the type or method of sample collection (e.g., core, grab).

Sample Type - The field ***SampleType*** links to luList04 and is used in both *tblSampleMaster* as well as the results tables. In the sample table, the Sample Type differentiates between normal samples (RESULT), negative control samples (CNEG), reference samples (REF), or field replicates (FR). In the results table, the Sample Type is also used to distinguish laboratory replicates (DUP).

If more than one sample was analyzed at a station, the ***SampleID*** is the same, and the replicate information is stored in other fields. If the additional sample is a field replicate, the field ***SampleType*** is filled with an FR. If the replicate is a laboratory replicate, the ***SampleType*** field is DUP. Note that no quality control sample types are currently stored in the database (except for bioassay negative controls).

A master sample table was created (*tblSampleMaster*) that contains basic sample information for both core and grab data. This table increases the efficiency of querying, and simplifies the use of the database for novice users. It contains the basic information necessary to describe a sample event (e.g., date, sediment depth).

♬ **NOTE** ♬ If you are interested only in basic sampling information such as the sample date or sediment depth, you do not need to include any core- or grab-related tables in your query.

Other fields included in *tblSampleMaster* include:

- ***Composite*** – This notes whether a sample was made from a composite of sediment samples.
- ***Date*** – Date of sample collection. .
- ***Upper/Lower Measure*** – Upper and lower sediment depth, assuming zero is the sediment/water interface, in cm

CONVENTION – Composite sample sediment depth

Samples that are composites (generally of core samples) have an average upper and lower sediment depth of all the individual samples that made up the composite sample in *tblSampleMaster*.

2.2 Sediment, Elutriate, and Water Chemistry Data

Chemistry data for sediment, tissue, and sediment elutriate and interstitial water samples are all stored in the same table, called *tblChemistryResults*. The matrix of the result is stored in a field called ***MaterialCode***, and linked to *luList17_TestMatrices*. Options include SD (sediment), EL (elutriate), and EX (waste extraction test). Currently the database contains no tissue data. The test matrix is different than the Test Type, as discussed below.

Much of the effort to compile the LTMS Database was in normalizing parameter names, and conducting a quality assurance review of units and values for the water quality data. All parameter names are normalized as stored in *luList18_ChemicalParameters* (Section 2.2.1). Because some results (especially for metals) were reported in both total and dissolved forms, the primary key for *tblChemistryResults* required the ***Fraction*** field (as linked to *luList11_Fraction*).

2.2.1 PARAMETER NAMES, UNITS, MATERIAL CODE AND MEASURING BASIS

Parameter names and units have all been standardized to increase the efficiency of analyses. The standard chemical names and units are stored in *luList18_ChemicalParameters*. For sediment analyses, the standard unit is stored as ***SolidUnits*** in *luList18_ChemicalParameters*. The standard units for the majority of organic chemicals is parts per billion (µg/kg), with the exception of dioxin/furan analyses (ng/kg), and general hydrocarbons (e.g., oil and grease) that are reported in mg/kg. Total recoverable metals are stored as mg/kg, and grain size and total organic carbon (TOC) are stored as percent (%).

Elutriate results are reported using the field ***WaterUnits*** in *luList18_ChemicalParameters*. Most units are µg/L except for conventional parameters such as total dissolved solids (mg/L). Similarly, waste extraction test results are also reported using the standardized ***WaterUnits*** again except for conventional laboratory measurements.

LuList18_Parameters includes a field called ***Group***, which can be used to query specific kinds of data (Section 3). If new parameters are added to the database, they must be present in luList18_Parameters.

2.2.2 RESULTS, QUALIFIERS, AND DETECTION LIMITS

Results were provided as reported unless they were converted to match standard units or text results. Because of the large number of data conversions required during normalization, the original result and units are also stored in *tblResults*. For results reported as below detection limits, a 'U' was stored in the qualifier field, and the reported value reflects the reporting limit. Definitions of all standardized qualifiers are stored in *luList13_QualifierCodes*.

Both the reporting limit (RL) and method detection limit (MDL) are included in the table, and were populated when available. The RL is the best estimate available for a sample and analyte, and can vary by sample and by batch. The RL is the concentration of a parameter that can be reliably reported in the presence of a moderate amount of sample-based interferences. The MDL is the limit of detection for a particular analytical method and instrument, and generally is the same for all samples in a batch. In the processing of the data, commonly other detection limits were available, including a "quantitation" limit or a "project required reporting limit." If a reported detection level is something other than a standard MDL or RL, this information is stored in the ***Comments*** field of t*blChemistryResults*.

Some rules were applied in storing the applicable detection level in the database:

- Detected values were stored in the database as reported (unless the value was converted to match the standard units).
- If RLs and/or MDLs were reported in the original data, these were carried over as reported, with no check to verify the use of these terms.
- For data reported as <#, with no reported MDLs or RLs, the # was stored in both the ***Results*** field and the ***RL*** field, 'U' in the ***Qualifier*** field, and –99 (missing) in the ***MDL*** field.
- For data reported as ND with no RL provided, the best available detection limit was used in the ***Results*** field; commonly this was provided in the Methods section of a report, and was either the MDL or the Contract Required Detection Limit.

- For data reported as ND with no detection limits provided, a –99 was placed in the ***Results*** field and a –99 in the ***MDL/RL*** fields.

2.2.3 Chemical Test and Method Information

Within the Chemistry Results table, there is a field called ***QABatch***. This field, along with the ***StudyID***, relates to the chemical method information that is stored in the table called *tblChemistryBatchInfo*. This table stores the preparation and analysis method information. For dredging-related data, commonly the ***TestType*** was used as the ***QABatch*** identifier to uniquely identify a batch of samples analyzed by the same method. The ***QABatch*** for monitoring data generally were incorporated as provided. Some data did not have method information; the ***QABatch*** in these cases is 'NA.' The information available in *tblChemistryBatchInfo* includes:

- ***TestType*** – As linked to *luList12_TestType*, this field contains the type of chemistry test (BULKSED, CITRATE, DIWET, DRET, EET, EL, MET, or WET). If the test type was only reported as "elutriate" than it was classified as "EL" (classified as the Standard Elutriate Test on Table 1-1).
- ***MaterialCode*** – This is the same as in *tblChemistryResults*, and is linked to *luList17_TestMatrices*.
- ***PrepCode*** – This field stores the preparation or extraction method used in preparing the sample for chemical analysis, and is linked to *luList34_ChemicalPreparationCodes*.
- ***MethodCode*** – This field stores the analysis method used for chemical analysis, and is linked to *luList33_ChemicalAnalysisMethods*.
- ***Agency Code*** –This is the code for the laboratory that conducted the analysis, and is linked to *luList01_AgencyCodes*.

2.3 Bioassay Data

There are three tables that contain bioassay results:

- *TblBiologyBatchInfo* - contains method, species, matrix, and test duration information;
- *TblToxicityResults* - contains raw replicate results, if available;
- *TblToxicitySumResults* - contains mean toxicity results, and includes identifiers for statistical significance of toxic response.

2.3.1 Toxicity Test Information

Toxicity test information is stored in the *tblBiologyBatchInfo*, and is linked to the Toxicity Results and Toxicity Sum Results tables on the field called ***QABatch***. This field, along with the ***StudyID***, relates to the toxicity method information. This table stores the fields that define the toxicity test, as linked to a series of lookup lists:

- ***TestType*** – the code for the test type, described in Lookup List 12;
- ***MaterialCode*** – the code for the matrix of the test, including sediment, elutriate, interstitial water, and sediment-water interface tests, described in Lookup List 17;
- ***SpeciesCode*** – the code for the test species, described in Lookup List 20;
- ***LifeStage*** – the code for the life stage of the test organism, described in Lookup List 22;

- ***ProtocolCode*** – the code for the test protocol references, as described in Lookup List 21;
- ***Test date, duration, and temperature*** – The date of the test, the duration (in number of days) of the test, and target temperature of the test.
- ***QACode*** – A code assigned to describe the usability of the test, described in Lookup List 23.

2.3.2 TOXICITY RESULTS

Replicate toxicity results were stored in *tblToxicityResults*, if available. This table has similar fields as *tblToxicitySummaryResults*, except that the replicate field is required. Each of the toxicity tables has several fields in common describing the test condition:

- ***SpeciesCode*** – the code for the test species, described in Lookup List 20;
- ***EPCode*** – the code for the test endpoint (e.g., survival), described in Lookup List 23;
- ***Units*** – units of the endpoint;
- ***Dilution*** – applicable to water tests, this value stores the concentration of the sample tested, expressed as a proportion (e.g., 0.5 = 50% concentration);
- ***QACode*** – A code assigned to describe the usability of the test, described in Lookup List 23.

CONVENTION – Test Endpoints

Test endpoints provided as mortality or abnormality were converted to survival and normality for ease of comparison across studies.

2.3.3 TOXICITY SUMMARY STATISTICS

The toxicity summary table stores a similar set of fields as the replicate table, but includes a series of summary values describing the results of that test. These fields include:

- ***Mean*** – mean value of laboratory replicates;
- ***N*** – number of replicates;
- ***StdDev*** – standard deviation of replicates;
- ***PctControl*** – mean value expressed as a percent of the negative control assigned to that batch of samples;
- ***SigEffect*** – reported statistical significance from original report and/or database;

The codes used for statistical significance for the ***SigEffect*** field is described in Lookup List 50. The codes differentiate between comparison to reference (SR/NSR) and control (SC/NSC). There is also a threshold value applied in some cases when comparing to reference. This most often is for sediment (solid phase) toxicity testing for dredging studies; if the resulting value is within 10% of reference, commonly there was no statistical analysis conducted (20% for amphipods, according to dredging guidelines). For more information on federal dredging testing and statistical guidelines (e.g., Green Book), see http://www.epa.gov/owow/oceans/gbook/index.html.

CONVENTION – Negative Control and Reference Samples

If there was more than one negative control sample analyzed for a batch of samples, only one was selected for calculation of percent control and for standardized negative control. The reason for the replicate controls, and the choice of which control to use for statistics, is provided in the metadata for that study. Commonly, a second control was analyzed if there was unacceptably low survival in the first batch. Reference samples were treated as normal results for control-normalization and significance calculations.

2.4 Dredged Material Volume Information

Most of the dredged material characterization studies report the estimated volumes of sediment to be dredged (pre-dredging estimate), as well as a proposed placement site for the sediment. This information has been compiled into the table called *tblDredgeFate*. The material is specific to a composite sample, as one sample represents one discrete dredging area. In some cases, a total volume of material was reported for multiple dredging areas. In these cases, the volume was split evenly between the composite sample records, and this information is stored in the ***Comments*** field. In most cases, the reported volumes include the volume to one foot of overdredge, this information is also stored in ***Comments***.

CONVENTION – Dredged Material Volume

All dredged material volume numbers are stored in units of cubic yards.

The other key piece of information stored in this table is the proposed placement site. These have been normalized in order to be able to sum the volumes for a specific placement site (Section 3).

3 User Guide for Query and Data Extraction Wizard

When the LTMS database is started, the opening screen shows several options available to interact with the database (Figure 1-2). An experienced user can bypass the query forms by just clicking on "Open Database." The "Hints" button is a short quick guide to the available buttons. For all menus, "Return to Splash" brings you back to the opening screen.

Queries were developed in tandem with the LTMS team to assist the user in understanding the content of the database, and how to extract data from it. The "Open Query Form" button opens a new form which has a list of pre-designed queries in the form of a question or statement describing what they do in prose (Figure 3-1). These queries are described in Section 3.1. To simply extract a set of data based on a data type and location, select the "Extract Data" button as described in Section 3.2.

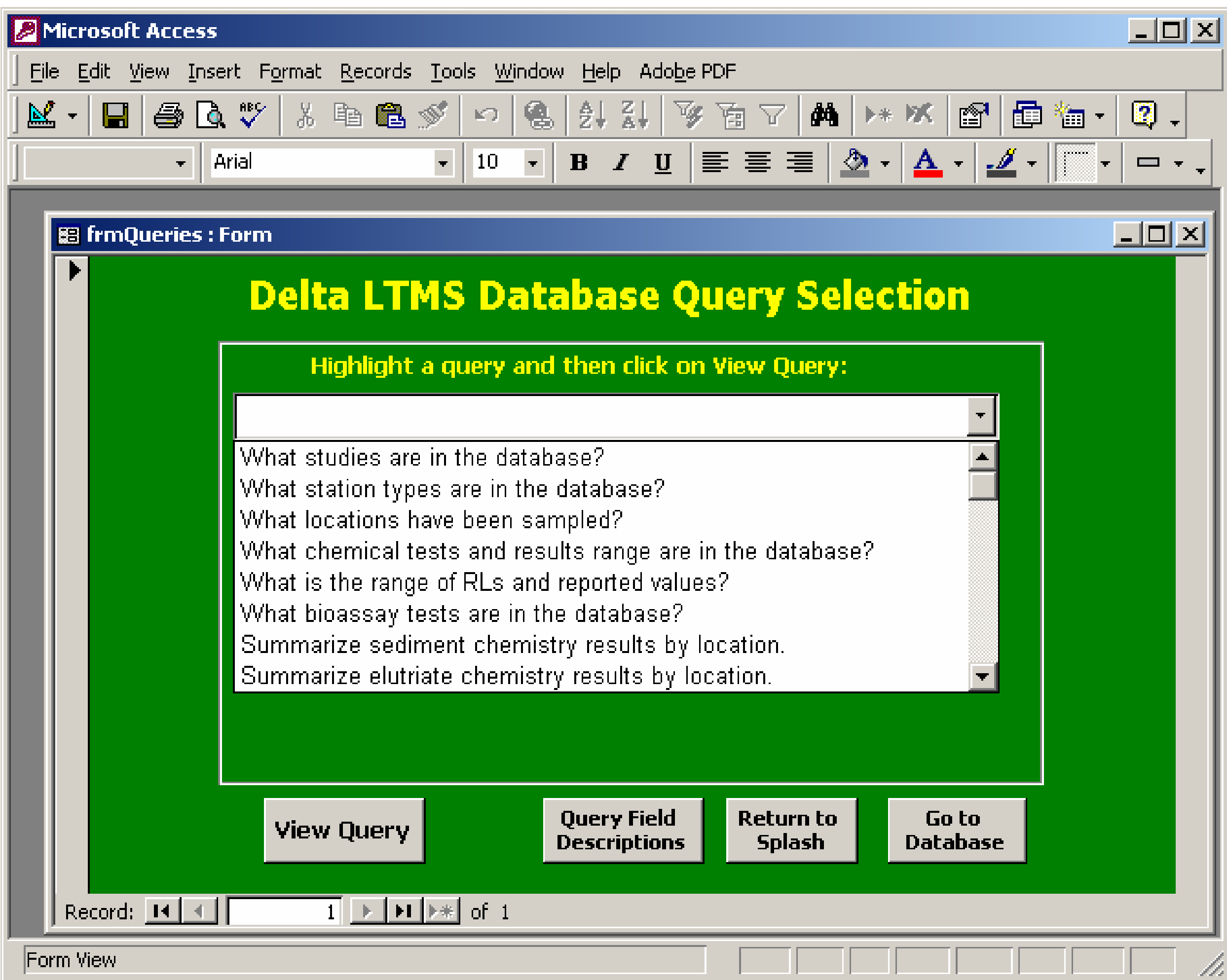


Figure 3-1. Delta LTMS Database Query Selection Form

NOTE This guide is for initiating the user to the database, and is not meant as a tutorial for Microsoft Access™. If you edit a query, you should save it as a new name for your own use so that the original query is kept as originally intended.

After you run the queries described below, you can choose to modify the query output by viewing the query in Design Mode, by clicking the *blue triangle* at the upper left of the Access screen. This guide provides a breakdown of example queries to show you how the query looks in Design Mode, and how to make changes. The query descriptions also include suggestions of how to modify the queries in the form of questions ( ) and answers ( ). **If you modify a query, you should change it to a new name so that the form will run the correct query during a later use.**

3.1 Delta LTMS Query Selection

The queries available in this module are generally summary queries, summarized by test type, chemical or bioassay group, and providing basic statistics (count, minimum, maximum). You can review what data are available in the database by using these queries, and then extract all of the individual record data in the Extract module (Section 3.2).

The possible list of queries in to run in this module are summarized in Table 3-1. To run a query, simply highlight it with the mouse, and then click on the "View Query" button. There are several queries that require a second step to select a particular location. These queries are shown on Table 3-1 as having a "Yes" in the Location column. There are two steps to select a location. The first is to filter the data by the ***StationType*** field (Figure 3-2). You can pick Dredging, Placement, or Monitoring Site. Note that the same location might have been sampled for a dredging study or a monitoring study, but these stations would have two different station types.

To filter by a station type, simply highlight one of the filters (including "Query All") which will not filter the selection) and the click on "Continue." This will open up the second level of location screen (Figure 3-3). This list will be filtered on just those stations that fit the station type filter selected in the previous step. Highlight a location, then click on "Run Query." This will run the query, and immediately prompt you whether you want to save the output to an Excel file.

NOTE All queries and extractions have the option of saving the file to an Excel file. By clicking on "Yes" when prompted, Excel will start and the data will be automatically placed in the file. Save and name the file to an appropriate location on your hard drive.

Except for the study and station list, most of the queries summarize data over the selected location, test type, and dates. Because they are summaries, information specific to any one result are not included in these queries (but are in the Data Extractions). There are several key fields included in the summary queries, described in the button labeled "Query Field Descriptions" and reproduced here:

Default null values: Unknown or unreported value = -99; Unknown Date = 1/1/1900; Unknown text = U or UNK; NR (not reported), or NA (not applicable).

Test type: BULKSED = Total recoverable (sediment); CITRATE, DIWET, WET = Citrate, DI-water, or standard Waste Extraction Test; DRET = Dredge Elutriate Test; EET = Effluent Elutriate Test; EL = Standard Elutriate Test (or unreported); MET = Modified Elutriate Test.

Fraction: T = Total; D = Dissolved; U = Unknown or Unreported.

Table 3-1. Query and data extractions available in the LTMS Database.

Query or Data Extraction Name	Database Query Name and Description	Location[1]
Query Choices		
What studies are in the database?	StudyList (reference, sample count, and start/end dates of each study)	
What station types are in the database?	StationList (station count by type)	
What locations have been sampled?	LocationList (station count by location)	
What chemical tests and results range are in the database?	ChemicalTests (N, Min, Max by test type, chemical group and name)	
What is the range of RLs and reported values?	DetectionLimitSummary_Crosstab (N, Min, Max by test type, chemical group and name, separated by detected and undetected)	
What bioassay tests are in the database?	BioassayTests (Count by matrix, species, and end point)	
Summarize sediment chemistry results by location.	Location_SedChemSummary (N, Min and Max RL, date range by location, chemical name for sediment)	Yes
Summarize elutriate chemistry results by location.	Location_ElutriateChemSummary (same as above for elutriate)	Yes
Summarize leachate chemistry results by location.	Location_LeachateChemSummary (same as above for leachate)	Yes
Summarize bioassay results by location.	Location_BioassaySummary (N, Min, Max and date range by matrix, species, and end point)	Yes
Summarize dredging volumes by project, placement site, and year.	DredgingVolumesbyProject	
Summarize dredging volumes by placement site and year.	DredgingVolumesbyPlacementSite	
Summarize dredging volumes by year.	DredgingVolumesbyYear	
Data Extraction Choices		
Sediment chemistry	All chemical groups	Yes
Elutriate chemistry	All chemical groups	Yes
Leachate chemistry	All chemical groups	Yes
Metals chemistry	All test types	Yes
Conventionals chemistry	All test types	Yes
Organotin chemistry	All test types	Yes
AVS/SEM chemistry	All test types	Yes
PAH chemistry	All test types	Yes
PCB chemistry	All test types	Yes
Pesticide chemistry	All test types	Yes
Phenol chemistry	All test types	Yes
Phthalate chemistry	All test types	Yes
Misc.semi-volatile chemistry	All test types	Yes
Volatile chemistry	All test types	Yes
Dioxin/Furan chemistry	All test types	Yes
Grain Size	Sediment only	Yes
Bioassay Summary	Bioassay only	Yes
Bioassay Replicate	Bioassay only	Yes

[1]Requires filtering data by a location.

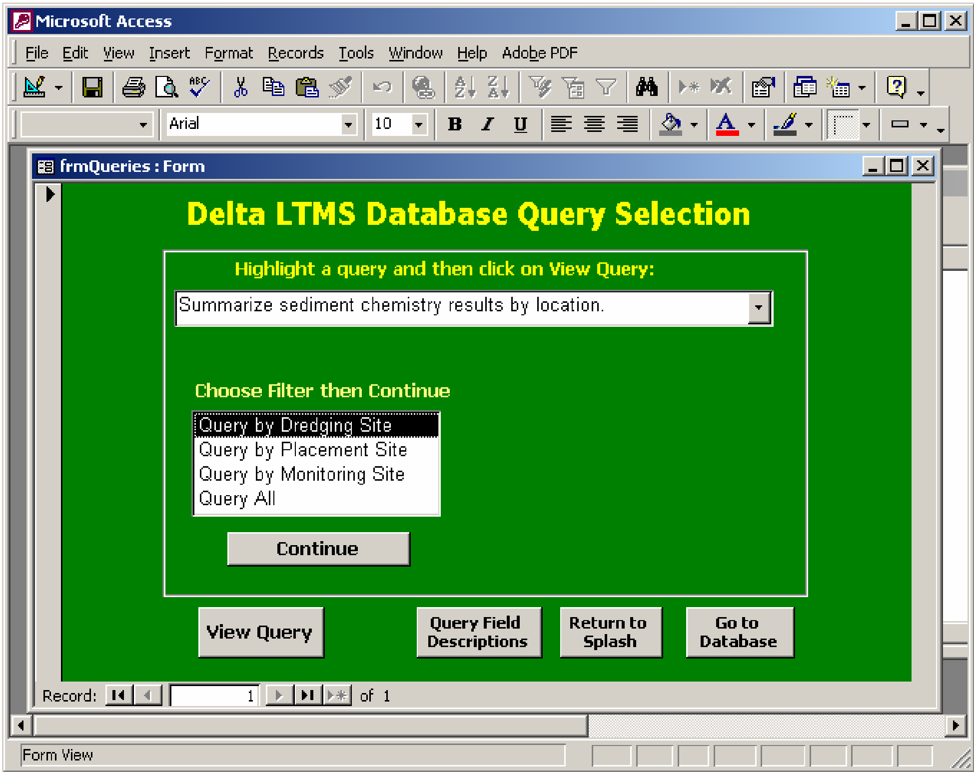


Figure 3-2. Delta LTMS Database Query Selection Form – Choose Station Type Filter

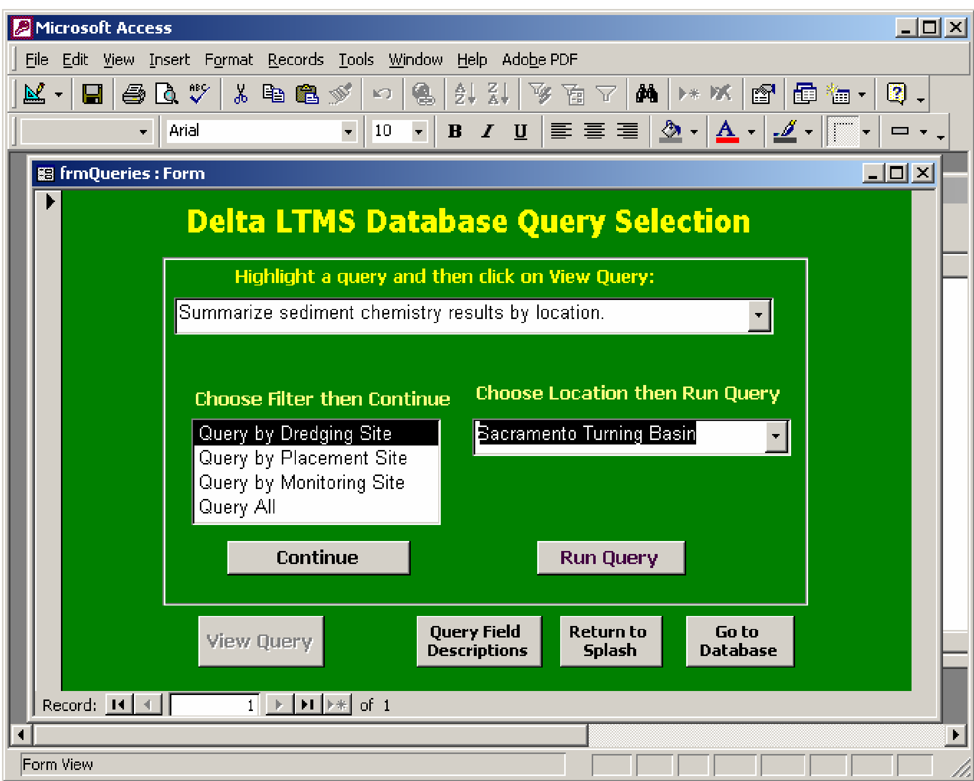


Figure 3-3. Delta LTMS Database Query Selection Form – Choose Location

NOTE AIf you want to run another query, make sure you start from the beginning to make sure you are querying for the correct criteria.

This guide includes a description of how a query is designed below as a brief guide to editing the query to suit your own use. For the first query ("What Studies are in the Database?"), the query includes basic study information (*tblStudy*) and study reference information (*tblStudyReference*; Figure 3-4.

Notice that *tblSampleMaster* was brought into this query, although the results show only one row for each study. This is because the ***StudyID*** and ***StudyName*** fields are used to group the results, then the samples defined uniquely by that group are counted. The summarize button (in red circle) are used to group the results.

NOTE An alternate name ("alias") is used in this query to describe the field summary fields, include "SampleCount," "StartDate" and "EndDate" so then instead of "CountofSampleID" shows up as the column heading (the default name from Access), a more descriptive name is selected. An alias can be used in the case that the field name is not specific enough.

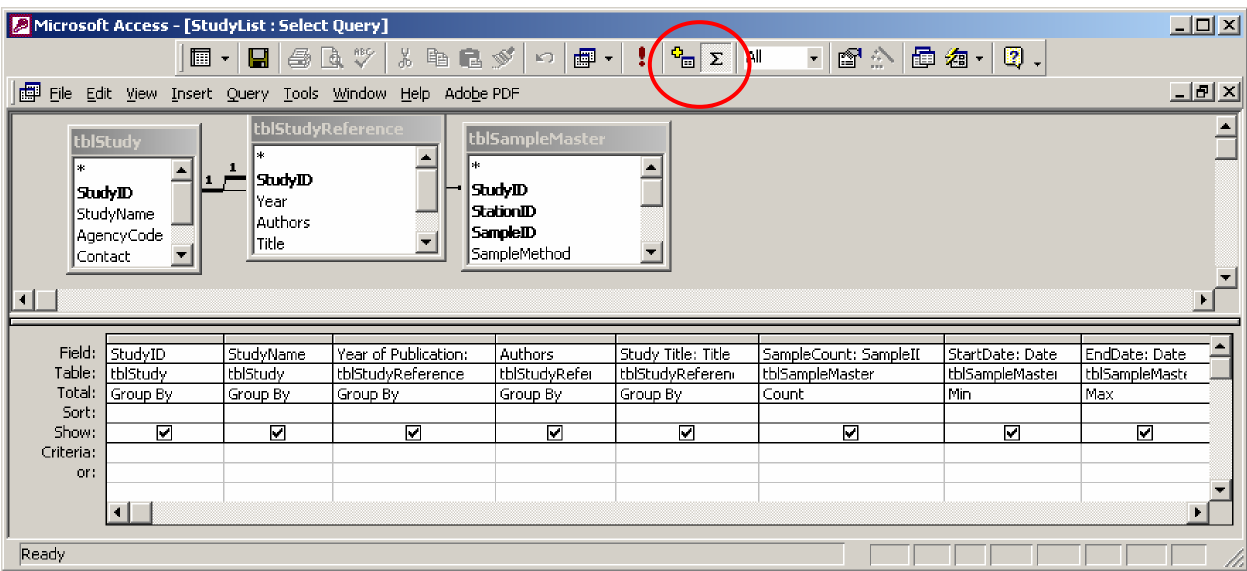


Figure 3-4. Query design for Query: "What Studies are in the Database?"

How would I modify this query to sort the data by ***Year***?

A The grouping query sorts in order from left to right. To sort by ***Year*** (alias name "Year of Publication"), use the left mouse to click on that column and drag it over to the left so it is the first column.

For the query "Summarize bioassay results by location" (Table 3-1), this Totals query calculates both a count of bioassay samples, and the range of reported values for each species and endpoint. Because it is a location query, it requires *tblStation* and the summary bioassay table (*tblToxicitySumResults*) with the species (List 20) and endpoint (List 23) lookup tables. Again an alias is used for the calculated fields.

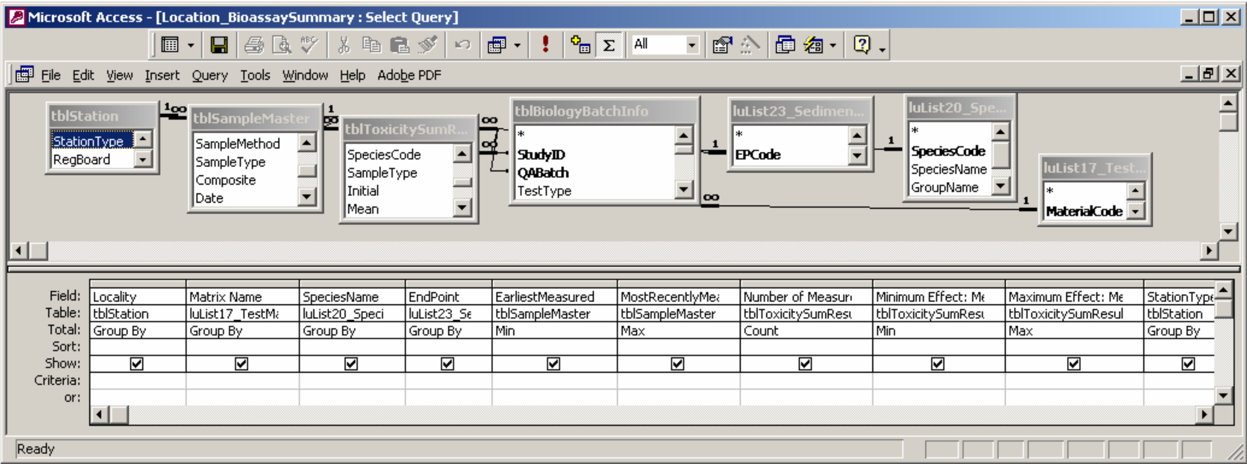


Figure 3-5. Query design for Query: "Summarize Bioassay Tests by Location"

How would I modify this query to view data ***only*** from the San Joaquin River?

A In order to select only records that have the ***Locality*** of "San Joaquin River," simply type in "San Joaquin River" in the Criteria row of the ***Locality*** field (Figure 3-6).

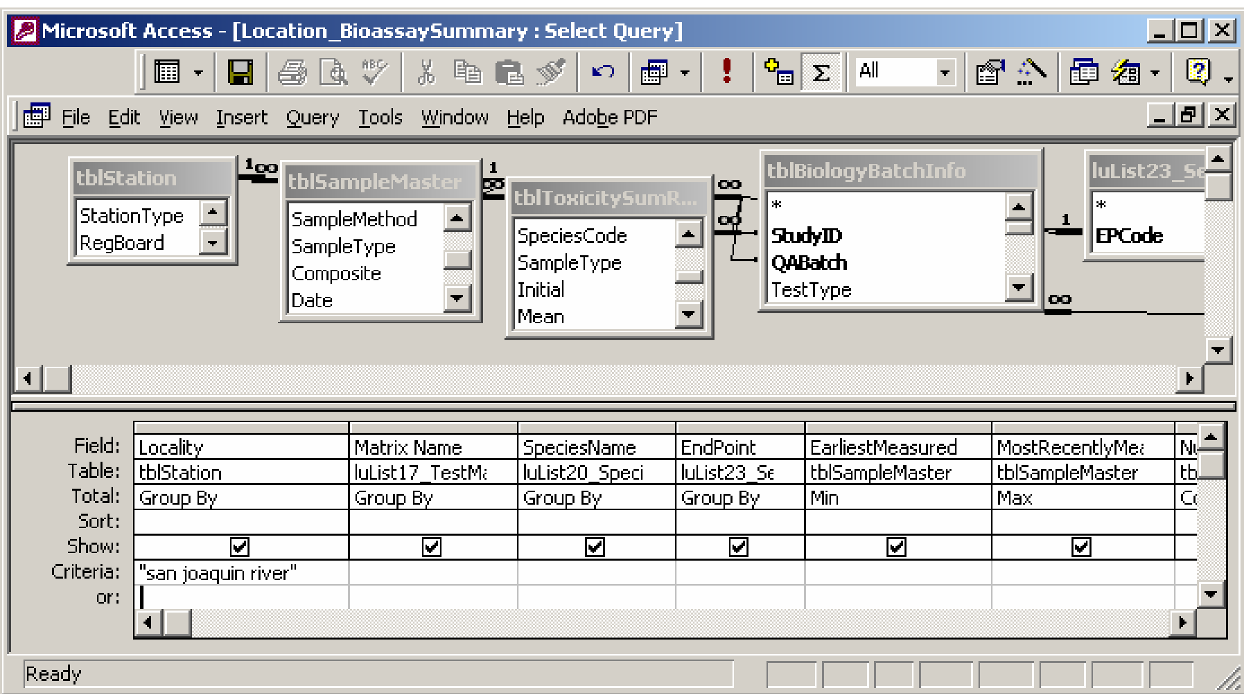


Figure 3-6. Query design Bioassay Test Summary - San Joaquin River

NOTE MS Access does not recognize differences in the case of the letter.

The final example is to show how the dredging volumes are summarized in the query "Summarize dredging volumes by project, placement site, and year." This query shows the total *estimated* volume of material dredged, by year and by *proposed* disposal site (Figure 3-7). It is a Totals query, grouped by ***Project Name*** and ***Year***. The total estimated volume (rounded to whole integers) is calculated based on the expression:

EstVol(cy): Round(Sum([tblDredgeFate].[PredictedVolume]),0)

The query also filters out records where the predicted volume = 0. Some samples are duplicated (if they appear both as an individual and as part of a composite), so that these values were set as zero so they would not be counted twice.

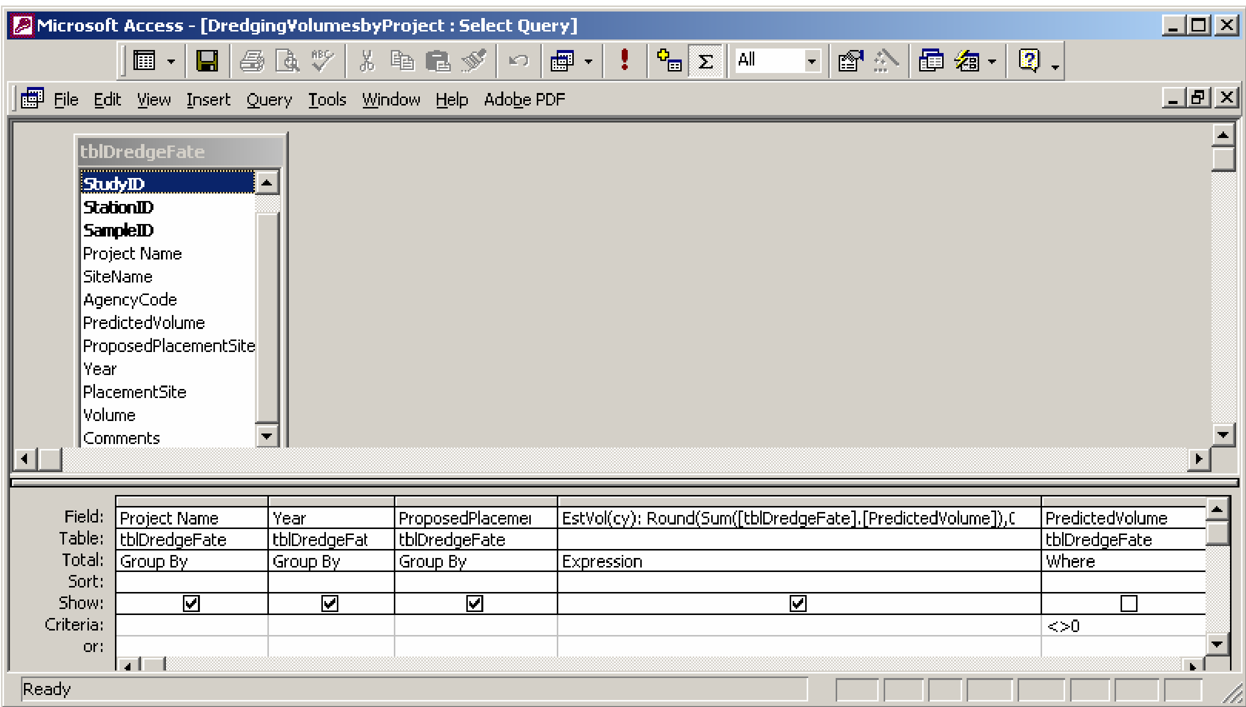


Figure 3-7. Query design for Query: Dredging Volumes by Project, Placement Site, and Year

3.1 Delta LTMS Data Extraction

The queries available in this module all retrieve raw data from the database, filtered on location and data type (Table 3-1). All queries result in the user being asked if they want to save the result to Excel (optional) as described above. To run a query, the first step is to "Choose a Locality" (Figure 3-8). Simply highlight the locality with the mouse, and then click on "Continue" button. This will open up a second list of the data types available for data extraction (Figure 3-9). After selecting a Query Type, then click on "Run Query."

NOTE AIf you want to run another data extraction, make sure you start from the beginning to make sure you are querying for the correct criteria.

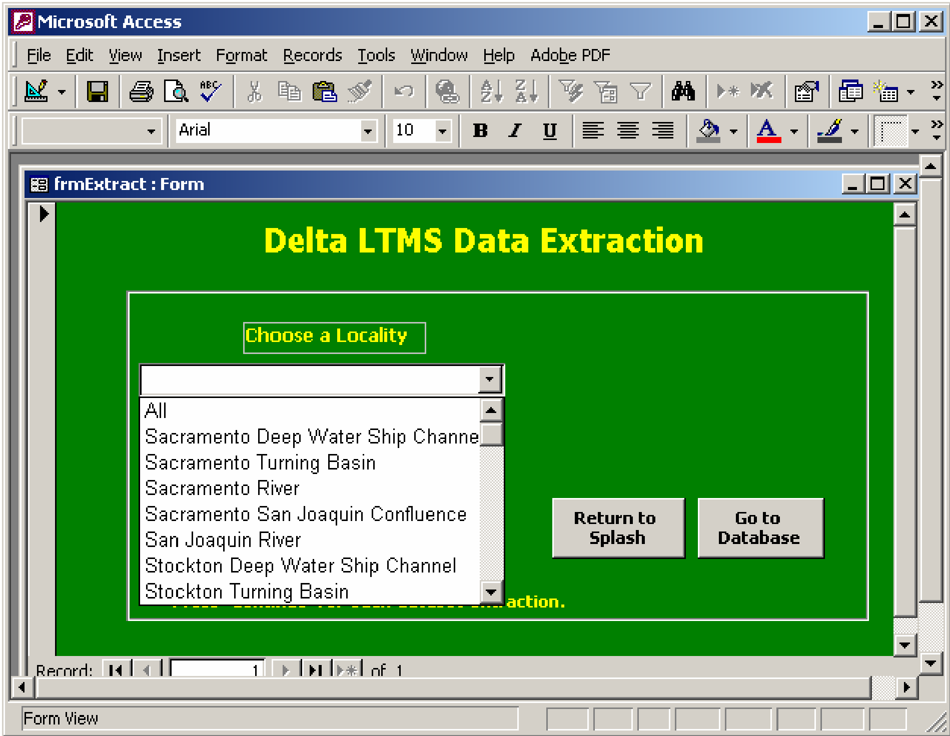


Figure 3-8. Delta LTMS Data Extraction – Choose a Locality

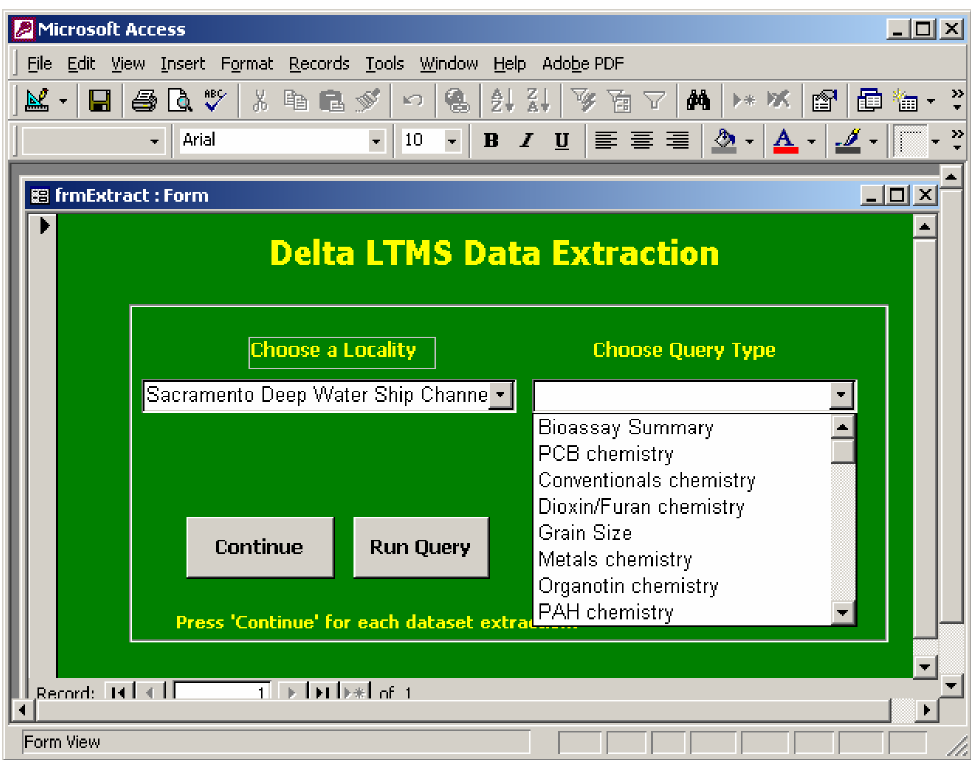


Figure 3-9. Delta LTMS Data Extraction – Choose Query Type

4 Glossary and References

4.1 Glossary

Database - A database is a collection of pieces of electronic information (known as *data*) that have been organized into categories (known as *fields*) and grouped into units (known as *records and tables*). Databases are created so information can be stored efficiently and quickly retrieved. Examples of databases are a library catalog or motor vehicle records.

Crosstab Query: A special kind of query where one field is summarized over the contents of a field of another, similar to a Pivot table.

Key Field/Primary Key – A well-designed table will have unique records for each record. The record will be unique for each primary key; for example, *tblStudy* will have only one record for each unique Study, as enforced by the primary key ***StudyID***. The LTMS Database has what is called a Multiple Primary Key, which uses the combination of several fields to define uniqueness.

Objects - Databases have objects (tables and queries) that can be thought of as discrete units that are contained within the database. Tables are the basic unit of data storage in database.

Query – A query is a statement that is used to extract data from a database. Also, within Access, it is an object that is used to store query statements. It can also be used as a verb (to query the database).

Relationships – A relationship defines how two or more tables are related through one or more key fields. Common types of relationships between two tables include one-to-one (each record in one table is related to one record in the other), or one-to-many. The relationships in the LTMS Database have been "enforced" which means that you cannot add a record to a lower-tier table ("child table") unless there is a matching record in the upper-tier table ("parent table"). For example, you cannot add a new sample to *tblSampleMaster* unless there is a matching ***StudyID*** and ***StationID*** in *tblStation*.

Table – Object within the database application used to store information.

Totals Query – A query that calculates specific summary values (count, sum, minimum, maximum, average, standard deviation) for a numeric field, and grouped by one or more parameters. This query is generated by clicking on the Greek Summary button (Σ).

Union Query – A special kind of query where multiple tables or queries with the exact same fields are pieced together into one output. Union queries can only be edited in SQL mode.

4.2 References

CALFED Bay-Delta Program. 2002. Delta Dredging and Reuse Strategy. Prepared by Central Valley Regional Water Quality Control Board and California Department of Fish and Game. June 2002.

Appendix A

Study List

StudyID	Study Name	Sample Count	Start Date	End Date
ACOE_SAC00	Sacramento River 2000 RM 6.3-37.7	14	13-Apr-00	13-Apr-00
ACOE_SAC01	Sacramento River 2001 NOI RM 4.83-43.56	7	23-Aug-01	22-Aug-01
ACOE_SAC02	Sacramento River 2002 NOI RM 4.51-7.86	2	18-Sep-02	18-Sep-02
ACOE_SAC03	Sacramento River 2003 NOI RM 5.11 - 33.52	5	16-Jul-03	16-Jul-03
ACOE_SAC05	Sacramento River 2005 NOI RM 4.45-34.09	9	08-Aug-05	08-Aug-05
ACOE_SAC06	Sacramento River 2006 NOI RM 5.68-12.97	6	21-Jul-06	21-Jul-06
ACOE_SAC86	Sacramento River 1986	16	01-Jul-86	01-Jul-86
ACOE_SAC95	Sacramento River 1995	4	08-Jun-95	07-Jun-95
ACOE_SAC97a	Sacramento River 1997 RM 29.5-35	4	21-Jul-97	21-Jul-97
ACOE_SAC97b	Sacramento River 1997 RM 8.7-10.6	4	08-Apr-97	08-Apr-97
ACOE_SAC98	Sacramento River 1998 RM 5.36-8.75	7	27-May-98	27-May-98
ACOE_SAC99	Sacramento River 1999 RM 7.23-12.88	8	25-May-99	25-May-99
ACOE_SJ95	San Joaquin River 1995 RM 8.5	4	12-Apr-95	12-Apr-95
ACOE_SJ96	San Joaquin River 1996	10	28-Jun-96	26-Jul-96
ACOE_STK00	Stockton DWSC 2000 RM 9-40	14	27-Jul-00	27-Jul-00
ACOE_STK01	Stockton DWSC 2001 NOI RM 11.7 - 34.9	6	24-Sep-01	25-Sep-01
ACOE_STK02	Stockton DWSC 2002 NOI RM 8.39-40.89	5	08-Aug-02	08-Aug-02
ACOE_STK03	Stockton DWSC 2003 NOI RM 5.68-40.61	11	25-Jun-03	25-Jun-03
ACOE_STK04	Stockton DWSC 2004 NOI RM 5.68-40.95	12	08-Sep-04	08-Sep-04
ACOE_STK05	Stockton DWSC 2005 NOI RM 11.82 - 39.77	13	12-Aug-05	15-Aug-05
ACOE_STK06	Stockton DWSC 2006 NOI RM 5.49-39.8	12	11-Jul-06	11-Jul-06
ACOE_STK94	Stockton DWSC 1994 RM 41-39.8	12	16-Mar-94	22-Jun-94
ACOE_STK95	Stockton DWSC 1995	6	06-Jun-95	07-Jun-95
ACOE_STK97	Stockton DWSC 1997 RM 5.5 to 39.0	13	09-Jun-97	09-Jun-97
ACOE_STK97e	Stockton DWSC 1997 Emergency RM 39-40	3	03-Apr-97	03-Apr-97
ACOE_STK98	Stockton DWSC 1998	7	16-Jun-98	16-Jun-98
ACOE_STK99	Stockton DWSC 1999 RM 5.45-40	16	10-May-99	15-Apr-99
ANDRUS88	Harbor Marina - Andrus Island 1988	4	17-Apr-88	17-Apr-88
ANDRUS89	Harbor Marina - Andrus Island 1989	7	14-Nov-89	14-Nov-89
ANDRUS90	Harbor Marina - Andrus Island 1990	3	19-Mar-90	19-Mar-90
ANTIOCH97	Antioch Marina 1997	1	19-Aug-97	19-Aug-97
BETHEL90	Bethel Island 1990	1	31-Jul-90	31-Jul-90
BETHEL94	Bethel Island 1994	2	01-Jun-94	01-Jun-94
BETHEL96	Bethel Island 1996 - Sugar Barge Marina	2	23-Jan-96	23-Jan-96
BPTCP	Bay Protection and Toxic Cleanup Program	19	27-Oct-95	18-Mar-97
DELS	DWR Dels Harbor Marina 2000	7	26-Apr-00	26-Apr-00
KIECON	Kie-Con Barge Landing 1997	1	09-Apr-97	09-Apr-97
LAURITZEN92	Lauritzen Marina - Antioch 1992	6	07-Oct-92	07-Oct-92
LAURITZEN97	Lauritzen Marina - Antioch 1997	7	29-Apr-97	29-Apr-97
LOSTISLE	Lost Isle Marina - Acker Island 2000	1	12-Aug-00	12-Aug-00
MCMUL	McMullin Tract - San Joaquin Riv 1994	4	22-Jul-94	22-Jul-94
MIDRIV_05	SDIP Middle River 2005	20	24-Aug-05	25-Aug-05
NDELTA90	DWR North Delta Program 1990 Draft EIR	7	29-Mar-90	29-Mar-00
NDELTA92	DWR North Delta Program 1992	16	06-Oct-92	15-Oct-92
NEWBRDG	New Bridge Marina - Antioch 1996	6	28-Mar-96	28-Mar-96
NOAA_01	NOAA San Francisco Bay 2001	5	30-Aug-01	20-Aug-01

StudyID	Study Name	Sample Count	Start Date	End Date
OLDRIV_04	SDIP Old River 2004	11	12-Feb-04	09-Feb-04
OLDRIV_05	SDIP Old River 2005 Addendum	3	25-Jul-05	22-Jul-05
ORWOOD	Orwood Marina 1997	1	01-Apr-97	01-Apr-97
OXBOW	Oxbow Marina - Andrus Island 1995	2	22-Aug-95	22-Aug-95
PGE97	PG&E Power Plant Contra Costa 1997	1	09-Sep-97	09-Sep-97
PIRATE89	Korth's Pirates Lair - Andrus Island 1989	1	11-Aug-89	11-Aug-89
PIRATE97	Korth's Pirates Lair - Andrus Island 1997	1	16-Jul-97	16-Jul-97
PITT_POWER	Pittsburg Power Plant Intake Channel Dredging 2000	2	28-Sep-00	28-Sep-00
POSK_MORM	Port of Stockton Mormon Channel 1993	3	07-Mar-93	07-Mar-93
RMP	Regional Monitoring Program	75	09-Mar-93	30-Aug-05
SDELTA_GC	DWR South Delta 1998 - Grantline Canal	16	15-Jun-98	15-Jun-98
SDELTA92	DWR South Delta 1992	18	16-Sep-92	25-Sep-92
SDELTA95	DWR South Delta 1995	18	30-Jan-95	30-Jan-95
SDELTA96	DWR South Delta 1996 - Old River	33	15-May-96	21-May-96
SDELTA99	DWR South Delta 1999 - Old Middle River	24	04-Oct-99	27-Sep-99
SSC_BUCK	Stockton Sailing Club - Buckley Cove 1995	3	26-May-95	26-May-95
STATEN	DWR Staten Island Hab Restoration 1994-95	35	13-Jul-94	13-Jul-94
SUIS_BAY98	Suisun Bay Channel 1998	7	21-May-98	20-May-98
SUIS_NYS94	Suisun Bay Channel - New York Slough 1994	6	18-Apr-94	20-Apr-94
SUIS_NYS99	Suisun Bay Channel - New York Slough 1999	6	20-May-99	19-May-99
SWAMP_RB5	Surface Water Ambient Monitoring Program Region 5	14	29-May-02	24-Sep-02
TYLER97	Tyler Island - District 563 1997	4	14-Mar-97	14-Mar-97
TYLER99	Tyler Island - District 563 1999	4	07-Jul-99	07-Jul-99
VILLAGE	Village West Marina Basin - Stockton 1999	3	10-Sep-99	10-Sep-99
WEMAP00	EMAP Western Pilot/NOAA 2000 San Francisco Bay	2	11-Jul-00	11-Jul-00

Appendix B

LTMS Database Specifications

The technical documentation below has been kept in separate files for the target audience of database managers and computer technical staff. Each document can be opened by clicking on the link below. Make sure the three associated PDF files are in the same folder as the main User Guide document. To optimize viewing of the electronic (pdf) version of this document, select 'Windows' and 'Show Bookmarks' to be able to navigate through the sections and figures.

Part A: Table List
Includes the Table Name and Description of the Table Name.

Part B: Field List
Includes the Table Name, Field Name, the Data Format (text, number, date/time), and whether the field is a Key Field